| | TECHNICAL NOTE | DATE 11-01-00 | MARKETS |
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| | | NUMBER 4426-00 | |

SUBJECT: MAX-4000 BI-DIRECTIONAL RS232 PROTOCOL

The following information is provided as a service to our users and customers:

1. Unit will operate in Print-Only mode by default.
   a) Output is sent automatically

2. Unit will only respond to Device Clear Command (CTRL-C) when in Print-Only mode.

3. Sending a Device Clear (CTRL-C), the device will respond with the prompt "=>" followed by <CR><LF>.

4. When a command is sent to the unit, the unit parses it, executes it, and returns a response (if applicable) followed by <CR><LF> and a prompt indicating the status of the command followed by <CR><LF>. The commands can not be nested. The host must wait for a response before sending another command.
   a) "=>" No errors detected and command was successful.

   b) "?>" Command error was detected. Command not executed because it was not understood.

   c) "!>" An execution error was detected. Command syntax was correct but was not executed successfully.

   d) "%" Battery Low symbol will be appended to the prompt if the unit is in battery low mode.

5. Command Set - All commands start with an "*" and end with a "?", i.e., *IDN?.
   a) *IDN? - Return device identification, serial #, and last calibration date.
   b)
      Format as follows: MAX 4000 E001234 01012000
   c) *PRT? - Puts device in Print-Only mode.

   d) *STATUS? – Returns status of unit.
      i) 0 – No operation currently in progress
      ii) 1 – Unit is auto zeroing
      iii) 2 – Unit is collecting charge
      iv) 4 – Unit is in overload

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e) *MODE? – Returns current mode unit is in.
   i) WARM_UP_MODE = 2
   ii) ZERO_MODE = 3
   iii) ZERO_PROGRESS_MODE = 4
   iv) ZERO_DONE_MODE = 5
   v) RANGE_SELECT_MODE = 6
   vi) BIAS_MODE = 7
   vii) RATE_MODE = 8
   viii) CHARGE_MODE = 9
   ix) RATE_CHARGE_MODE = 10
   x) COLLECT_CHARGE_MODE = 11
   xi) COLLECT_RATE_CHARGE_MODE = 12
   xii) BATT_CHARGE_MODE = 13
   xiii) OVERLOAD_MODE = 14

f) *AUZ? – Perform Auto Zero
   i) Not valid during charge collection
   ii) Must be performed on currently selected input range before rate or charge commands are issued.
   iii) Starts immediately. Most commands will be invalid during zeroing.
   See specific command descriptions.

g) *RNG? - Returns currently selected input range
   i) 0 - low range
   ii) 1 - high range

h) *RNG<value>? – Sets input range to <value> and puts unit into range select mode.
   i) Not valid during a Charge Collection
   ii) Not valid during auto-zeroing
   iii) Only the following values are valid:
      a) 0 – low range
      b) 1 – high range

i) *NEEDZ? – Returns whether selected range needs autozeroing.
   i) Valid only during range select mode.
   ii) 0 – No, selected range does not need autozeroing.
   iii) 1 – Yes, selected range does need autozeroing.

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j) *RATE? – Puts unit into Rate Mode and Print Mode.
   i) Not valid during zeroing.
   ii) Command not valid during a Charge Collection
   iii) Currently selected input range must have been previously zeroed

k) *CURRATE? – Returns current rate value.
   i) Only valid in Rate mode and during Rate Charge collection.

l) *CHG? - Puts unit into Charge mode.
   i) Not valid during zeroing.
   ii) Not valid during charge collection.
   iii) Currently selected input range must have been zeroed.

m) *CHG<value>? – Puts unit into Charge mode.
   i) Not valid during zeroing.
   ii) Value is charge collection time in seconds, ie 015, 030, 045,…
   iii) Value range must be between 15-600 seconds in multiples of 15, or MAX. Any other value generates an execution error.
   iv) Not valid during charge collection
   v) Currently selected input range must have been previously zeroed

n) *RTCHG? - Same as *CHG?, except put unit in Rate-charge mode.

o) *RTCHG<value>? – Same as *CHG<value>? Except puts unit in Rate Charge mode.

p) *CURCHG? – Returns current collected charge value.
   i) Only valid during Charge and Rate Charge collection.

q) *START? – Starts Charge Collection Mode.
   i) Valid only if in Charge mode or Charge/Rate modes if not currently collecting.
   ii) Unit goes into Print-Only mode.

r) *STOP? – Stops a Charge Collection
   i) Valid only if in Charge or Charge/Rate modes and currently collecting.

ii) Need to send CTRL-C (Device Clear) to exit Print-Only mode, then this command to stop a charge collection.

s) *BIAS? - Returns current DC bias level.
- i) 100 = 100% (300V)
- ii) 50 = 50% (150V)
- iii) 0 = 0% (0V)
- iv) -50 = -50% (-150V)
- v) -100 = -100% (-300V)

t) *BIAS<value>? – Sets high voltage DC bias level and puts unit into bias mode.
- i) Selected range must have been zeroed.
- ii) Value must be one of the following: 100, 50, 0, -50, -100.
- iii) Not valid during Print-Only mode.
- iv) Not valid during Warm-up mode.
- v) Not valid during Autozero mode.
- vi) Not valid during Charge Collection mode.

u) *BATT? – Returns the percent left of battery capacity.

v) *SER? – Returns serial number
- i) Returns 7 character serial number

w) *SER<XXXXXXX>? - Stores serial number
- i) Must be 7 characters in length
- ii) Calibration jumper must be installed or value will not be stored

x) *CALDATE? – Returns Last Calibration Date
- i) Returned Format = MMDDYYYY

y) *CALDATE<value>? – Sets Calibration Date
- i) Format = MMDDYYYY